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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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John Mak

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EXAMINER

YOUNG, NATASHA E

ART UNIT

PAPER NUMBER

1797

MAIL DATE

DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/528,435	Applicant(s) MAK, JOHN	
	Examiner NATASHA YOUNG	Art Unit 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☒ Claim(s) 4, 11, 17 and 19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 February 2005 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>02/24/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

The disclosure is objected to because of the following informalities: The word "Joule-Thompson" (see page 4, line 5 and page 10, lines 22) should be "Joule-Thomson".

Appropriate correction is required.

The disclosure is objected to because of the following informalities: The word "are" (see page 1, line 22; page 6, line 32; and page 7, line 9) and the word "comprises" should be "comprise" (see page 4, line 5).

Appropriate correction is required.

Claim Objections

Claim 17 is objected to because of the following informalities: The letter "s" should be "a" (see line 3). Appropriate correction is required.

Claims 4, 11, and 19 are objected to because of the following informalities: "Joule-Thompson" should be "Joule-Thomson". Appropriate correction is required.

Claim 8 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The statement that the claimed elements (two coolers and an absorber) "are installed as an upgrade to an existing plant", since the structure of claim 8 is disclosed in claim 1 the claim is not further limiting.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 5, 8, and 16-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Campbell et al (US 6,182,469 B1).

Regarding claim 1, Campbell et al teaches a natural gas liquid plant, comprising: a separator (11) that separates a cooled low pressure feed gas (31a) into a liquid portion (35) and a vapor portion (34), wherein the liquid portion is reduced in pressure in a first pressure reduction device (16), thereby providing refrigeration for a first cooler that cools a low pressure feed gas thereby forming the cooled low pressure feed gas; wherein at least part of the vapor portion is cooled in a second cooler (12) and reduced in pressure in a second pressure reduction device (13) before entering an absorber (17) as lean absorber reflux (36b); and wherein the absorber produces an absorber overhead product (37) that provides refrigeration for the second cooler (12), and wherein the absorber produces an absorber bottoms product (38) that is fed into a demethanizer (19) as lean reflux (38b) (see figure 1 and column 4, line 33 through column 6, line 17).

Claims 2-3 and 5 depend on claim 1 such that the reasoning used to reject claim 1 will be used to reject the dependent portion of the claims.

Regarding claim 2, Campbell et al teaches a natural gas liquid plant wherein the low pressure feed gas has a pressure of about 300 psig to about 1000 psig (see column 4, lines 33-46).

Regarding claim 3, Campbell et al teaches a natural gas liquid plant wherein a portion of the low pressure feed is cooled in a plurality of side reboilers that are thermally coupled to the demethanizer (see column 5, lines 46-63).

Regarding claim 5, Campbell et al teaches wherein the liquid portion that is reduced in pressure (35a) is fed into the demethanizer (see figure 1 and column 4, line 63 through column 5, line 63).

Regarding claim 8, Campbell et al teaches two coolers (10, 12) and an absorber (17) (see figure 1) such that the limitations of the claim are met.

Regarding claim 16, Campbell et al teaches a natural gas liquid plant that comprises a separator (11) receiving a cooled low pressure feed gas (31a) and fluidly coupled to an absorber (17) and a demethanizer (19), wherein refrigeration duty of the absorber and demethanizer are provided at least in part by expansion of a liquid portion of the cooled low pressure feed gas and an expansion of a vapor portion using a device other than a turboexpander (14, 16) (see figure 1 and column 4, line 33 through column 6, line 17), since the compressor portion (15) is optionally such that it is not a turboexpander.

Claims 17-18 depend on claim 16 such that the reasoning used to reject claim 16 will be used to reject the dependent portions of the claims.

Claim 17 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Vijayaraghavan et al (US 5,566,554).

Regarding claim 17, Campbell et al teaches a natural gas liquid plant wherein the cooled low pressure feed gas (31a) has been cooled by a cooler (10) that employs an expanded liquid portion of the cooled low pressure feed gas as a refrigerant (40, 41, 42) (see figure 1 and column 4, line 33 through column 6, line 17), since the expanded liquid portion (35a) enters the absorber (17) through the pump (18) through the demethanizer (19) and the outlets (40, 41, 42) are used as refrigerants in the cooler (10)..

In the alternative, if the Campbell reference does not disclose that the expanded liquid portion of the cooled low pressure feed gas is employed as a refrigerant Vijayaraghavan et al teaches a natural gas liquid plant wherein the cooled low pressure feed gas (4) has been cooled by a cooler (8) that employs an expanded liquid portion of the cooled low pressure feed gas (4) as a refrigerant (26) (see figure 1 and column 4, line 33 through column 6, line 17).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Campbell et al with the teachings of Vijayaraghavan et al to reduce cost by reducing the need for external refrigerant.

Regarding claim 18, Campbell et al teaches a natural gas liquid plant (17) wherein the absorber produces an absorber bottom product (38) that is fed to the demethanizer (19) as reflux (44) (see figure 1 and column 5, lines 46-63).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 4, 7, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Campbell et al (US 6,182,469 B1).

Claims 4 and 7 depend on claim 1 such that the reasoning used to reject claim 1 will be used to reject the dependent portions of the claims.

Regarding claim 4, Campbell et al discloses a natural gas liquid plant wherein the first pressure reduction device comprises an expansion device, and wherein the second pressure reduction device comprises an expansion valve and that the typically available expanders are capable of recovering on the order of 80-95% of the work theoretically available in an ideal isentropic expansion (see figure 1 and column 4, line 63 through column 5, line 35).

Campbell et al does not disclose the first pressure reduction device comprises a hydraulic turbine, and wherein the second pressure reduction device comprises a Joule-Thompson valve.

It would have been obvious to one having ordinary skill in the art at the time the invention would made to use a hydraulic turbine, since it was known in the art that a hydraulic turbine is an expansion device (see MPEP 2144.03 (A-E)).

It would have been obvious to one having ordinary skill in the art at the time the invention would made to use a Joule-Thomson valve, since it was known in the art that a Joule-Thomson valve is an expansion valve (see MPEP 2144.03 (A-E)).

Regarding claim 7, Campbell et al teaches that 84.89% of ethane is recovered and 96.50% of propane is recovered.

Campbell does not teach at least 85 mol% of ethane is recovered and at least 99 mol% of propane is recovered.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have at least 85 mol% of ethane is recovered and at least 99 mol% of propane is recovered, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05 (II-A)).

Claim 19 depends on claim 16 such that the reasoning used to reject claim 16 will be used to reject the dependent portions of the claim.

Regarding claim 19, Campbell et al teaches a natural gas liquid plant wherein the separator (11) separates a vapor portion (32) from the cooled low pressure feed gas

(31a) and wherein a first part of the vapor portion is further cooled via an expansion valve (13) and introduced into the absorber (17) (see figure 1 and column 4, line 63 through column 5, line 20).

Campbell et al does not disclose a Joule-Thomson valve.

It would have been obvious to one having ordinary skill in the art at the time the invention would made to use a Joule-Thomson valve, since it was known in the art that a Joule-Thomson valve is an expansion valve (see MPEP 2144.03 (A-E)).

Claim 20 depends on claim 19 such that the reasoning used to reject claim 19 will be used to reject the dependent portions of the claim.

Regarding claim 20, Campbell et al teaches a natural gas liquid plant wherein a second part of the vapor portion (32) is expanded and cooled in a turboexpander (14, 15) (see column 4, line 63 through column 5, line 36).

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Campbell et al (US 6,182,469 B1, 2001) as applied to claim 1 above, and further in view of Campbell et al (US 4,061,481, 1977).

Claim 6 depends on claim 1 such that the reasoning used to reject claim 1 will be used to reject the dependent portions of the claim.

Regarding claim 6, Campbell et al (2001) discloses a natural gas liquid plant wherein part of the vapor portion is expanded in a turboexpander and employed as a lean demethanizer reflux and a vapor that is fed into the absorber.

Campbell et al (2001) does not disclose a part of the vapor portion is fed into a second separator that produces a liquid that is employed as a lean demethanizer reflux.

Campbell et al (1977) discloses a part of the vapor portion is fed into a second separator (18) that produces a liquid (42) that is employed as a lean demethanizer (15) reflux (see figure 2).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Campbell et al (2001) with the teachings of Campbell et al (1977) to improve recovery of products by the addition of a separator that would separate the hydrocarbons.

Claims 9-12 and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vijayaraghavan et al (US 5,566,554) in view of Campbell et al (US 6,182,469 B1).

Regarding claim 9, Vijayaraghavan et al discloses a natural gas liquid plant, comprising: a primary (13) and secondary (8) cooler that cool a low pressure feed gas (1), and a separator (6) that separates the cooled low pressure feed gas in a liquid portion (18) and a vapor portion (16) and a first pressure reduction device (24) that reduces pressure of the liquid portion and thereby provides refrigeration for the secondary cooler (8) (see figure 1 and column 4, line 20 through column 5, line 7).

Vijayaraghavan et al does not disclose a third cooler that cools at least part of the vapor portion, wherein the cooled vapor portion is expanded in a pressure reduction device, and an absorber that receives the cooled and expanded vapor portion and produces an overhead product that provides refrigeration for the third cooler and a bottom product that is employed as reflux in a demethanizer.

Campbell et al discloses a cooler (12) that cools at least part of the vapor portion (33), wherein the cooled vapor portion is expanded in a pressure reduction device (13), and an absorber (17) that receives the cooled and expanded vapor portion and produces an overhead product that provides refrigeration for the cooler and a bottom product (38) that is employed as reflux in a demethanizer (19) (see figure 1 and column 4, line 33 through column 5, line 63).

Campbell et al does not disclose a secondary cooler wherein a portion of expanded liquid portion provides refrigeration for the secondary cooler.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Vijayaraghavan et al with the teachings of Campbell et al to provide additional rectification of the vapor phase.

Claims 10-12 and 14-15 depend on claim 9 such that the reasoning used to reject claim 9 will be used to reject the dependent portions of the claims.

Regarding claim 10, Vijayaraghavan et al does not disclose a natural gas liquid plant wherein the low pressure feed gas is at least partially dehydrated and has a pressure of between about 300 psig and about 1000 psig.

Campbell et al teaches an inlet feed with pressures in the range of 600 to 100 psia (column 3, lines 9-19) and the feed stream is usually dehydrated (see column 4, lines 33-46).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Vijayaraghavan et al with the teachings of Campbell et al to reduce operation costs by running the process at lower pressures

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and warmer temperatures and to prevent hydrate (ice) formation under cryogenic conditions (see Campbell et al column 3, lines 9-19 and column 4, lines 33-46).

Regarding claim 11, Vijayaraghavan et al discloses a natural gas liquid plant wherein the first pressure reduction device comprises an expander (20) and wherein the second pressure reduction device comprises an expansion valve.

Vijayaraghavan et al does not disclose the first pressure reduction device comprises a hydraulic turbine, and wherein the second pressure reduction device comprises a Joule-Thompson valve.

It would have been obvious to one having ordinary skill in the art at the time the invention would made to use a hydraulic turbine, since it was known in the art that a hydraulic turbine is an expansion device (see MPEP 2144.03 (A-E)).

It would have been obvious to one having ordinary skill in the art at the time the invention would made to use a Joule-Thomson valve, since it was known in the art that a Joule-Thomson valve is an expansion valve (see MPEP 2144.03 (A-E)).

Regarding claim 12, Vijayaraghavan et al does not disclose a natural gas liquid plant wherein a portion of the low pressure feed gas is cooled in a plurality of side reboilers that are thermally coupled to the demethanizer.

However, Vijayaraghavan et al discloses a natural gas liquid plant wherein a portion of the low pressure feed gas is cooled in a plurality of heat exchangers that are thermally coupled to the demethanizer.

It would have been obvious to one having ordinary skill in the art at the time the invention would made to use a plurality of side reboilers, since it was known in the art that a side reboiler is a heat exchanger (see MPEP 2144.03 (A-E)).

Campbell et al teaches a natural gas liquid plant wherein a portion of the low pressure feed is cooled in a plurality of side reboilers that are thermally coupled to the demethanizer (see column 5, lines 46-63).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Vijayaraghavan et al with the teachings of Campbell et al to improve recovery and reduce the size of the heat exchangers (see Campbell et al column 3, lines 20-32).

Regarding claim 14, Vijayaraghavan et al discloses a natural gas liquid plant wherein the primary cooler employs as least one of external ethane, external propane, and the absorber overhead product as a refrigerant, since portions of the inlet gas (18) is used in cooler (8) to cool inlet gas (2).

Regarding claim 15, Vijayaraghavan et al is silent regarding a natural gas liquid plant wherein ethane recovery is at least 85 mol % and propane recovery is at least 99 mol %.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have at least 85 mol% of ethane is recovered and at least 99 mol% of propane is recovered, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05 (II-A)).

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vijayaraghavan et al (US 5,566,554) and Campbell et al (US 6,182,469 B1, 2001) as applied to claim 9 above, and further in view of Campbell et al (US 4,061,481, 1977).

Claim 13 depends on claim 9 such that the reasoning used to reject claim 9 will be used to reject the dependent portions of the claim.

Regarding claim 13, Vijayaraghavan et al discloses a natural gas liquid plant wherein part of the vapor portion (16) is expanded in a turboexpander (20) (see figure 1).

Vijayaraghavan et al does not disclose part of the vapor portion is fed into a second separator that produces a liquid that is employed as a lean demethanizer reflux and a vapor that is fed into the absorber.

Campbell et al (2001) discloses a natural gas liquid plant wherein part of the vapor portion is expanded in a turboexpander and employed as a lean demethanizer reflux and a vapor that is fed into the absorber.

Campbell et al (2001) does not disclose a part of the vapor portion is fed into a second separator that produces a liquid that is employed as a lean demethanizer reflux.

Campbell et al (1977) discloses a part of the vapor portion is fed into a second separator (18) that produces a liquid (42) that is employed as a lean demethanizer (15) reflux (see figure 2).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Campbell et al (2001) with the teachings of Campbell et al (1977) to improve recovery of products by the addition of a separator that would separate the hydrocarbons.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Vijayaraghavan et al with the teachings of Campbell et al (2001) and Campbell et al (1977) to provide additional rectification of the vapor phase and to improve recovery of products by the addition of a separator that would separate the hydrocarbons.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lee et al (US 6,401,486 B1), Lee et al (US 6,244,070 B1), Campbell et al (US 5,568,737), and Rambo et al (WO 98/47839).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATASHA YOUNG whose telephone number is (571)270-3163. The examiner can normally be reached on Mon-Thurs 7:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

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USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NY

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